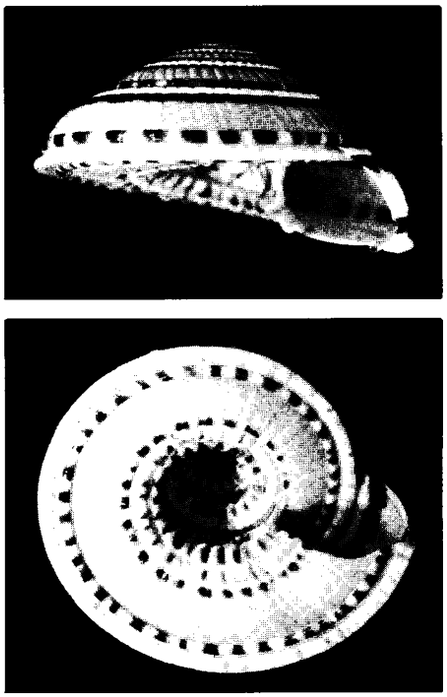

Architectonica perspectiva from Nosy-Be, Madagascar. "This snail lives in the sand, and is often found on poisonous zoanthids. Eggs are brooded in the broad umbilicus. Top, Lateral view of shell; bottom, ventral view showing umbilicus. This specimen is 34 mm in diameter." [From *A Natural History of Shells*]

197): "Molluscan shells offer a particularly rich chronicle of economic life and times of the past . . . day-to-day travails and successes of their builders . . . risks, costs, and benefits." In the history of mollusks, he points out, intervals of success and growth have been brief and rare, followed by long periods of stability and decline. High energy and resource dependence set up susceptibilities to physical crises; molluscan history reflects many such interruptions and provides a warning (p. 199) that "improvements in resource acquisition come at the expense of others in a society or an ecosystem subject to resource limitation."

No shell book can, I suppose, be published without pictures; this one provides excellent photographs, both in color and in black and white. Each specimen is carefully documented as to geographic source and size, but, alas, there is no mention of their ecological circumstances (for example, water depth or bottom type). The diagrams accompanying the text have little impact. Every shell book has a taxonomic burden, and common names are often included. Not here, and there is a rather strong presumption that the reader has a thorough knowledge of gastropod species, genera, and families.

All in all, this is a highly informative and readable review of themes that will be familiar to those who already know Vermeij's work. For those unfamiliar with his many contributions, it is a well-written, even philosophical introduction, overview, and synthesis.

W. Bruce Saunders
Department of Geology,
Bryn Mawr College,
Bryn Mawr, PA 19010, USA

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Probing Biological Surfaces

STM and SFM in Biology. OTHMAR MARTI and MATTHIAS AMREIN, Eds. Academic Press, San Diego, CA, 1993. xii, 331 pp., illus. $69.95 or £54.

Twelve years have passed since the invention of the scanning tunneling microscope was reported by Binnig and Rohrer, and half that many years since Binnig, Quate, and Gerber introduced its cousin instrument, the scanning force microscope. In the intervening years, STM and SFM have had a large impact on many areas of physics, chemistry, and biology, and they are still developing at a vertiginous rate. More than a dozen different types of probe- or tip-based microscope exist today, and still more are likely to emerge. This proliferation of related methods best illustrates the unprecedented control of space first made possible by the original probe-piezo electric design.

In no area has the excitement about this new generation of microscopes been greater than in biology, for the operation of these instruments is not restricted to artificial or unnatural environments. This book attempts to put into perspective the biological applications of both STM and SFM. The task is not an easy one. The reason is twofold: First, it has been in biology that the applications of STM have been the most controversial. Second, the rapid growth of the applications of SFM in biology makes it very difficult to provide an account, in book format, of the current state of the field.

Each of the contributions to this book is largely self-contained. In the opening chapter, which constitutes about 40 percent of the book, Marti provides an in-depth description of the theoretical and technical principles underlying scanning probe microscopy, with special emphasis on STM, SFM, and scanning near-field optical microscopy (SNOM). It is an excellent synthesis and provides good access to the most relevant literature, but the presentation is formal, and the chapter is clearly directed to the professional interested in acquiring a general background in the physical foundations of these techniques. The chapters that follow discuss only those STM applications that have proved to be both reliable and reproducible. Among these are imaging of electrochemically deposited nucleic acids and proteins, high-resolution imaging of monolayers of liquid crystalline arrays of molecules, and imaging of proteins and membranes at high tip–sample bias voltages. A concise but rigorous account is given of the technical aspects and current limitations of each area. The final two chapters are dedicated to the biological applications of SFM, addressing the main issues encountered by the experimentalist using the microscope on biological samples. A clear effort has been made throughout the book to address methodological issues and maintain an analytic stance rather than simply giving an exhaustive but superficial review of the literature.

Although the individual chapters succeed at their tasks, the book as a whole projects a somewhat skewed perspective of the field in that most of the chapters are dedicated to STM even though it is becoming increasingly apparent that further developments in the applications of STM in biology may be difficult, owing primarily to the low conductivity of the samples. In fact, STM may never leave the specialist's laboratory to become a tool of general use in the broader biological community. It is SFM that is currently yielding the greatest number of biological applications and is likely to continue to do so in the future. Yet it is only during the last year and a half that reports have appeared on such important developments as reliable imaging of biomolecules under air and aqueous solutions, the implementation of the tapping mode of operation of the scanning force microscope, and new methods of deposition, specific labeling of macromolecules, and tip fabrication.

In sum, this book provides a good overview of both the physical foundations of scanning probe microscopy and the more technical issues involved in its applications in biology. It is a useful reference that nicely complements more circumscribed reviews that are better designed for hitting fast-moving targets.

Carlos Bustamante
Institute of Molecular Biology,
University of Oregon,
Eugene, OR 97403–1229, USA

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